U.S. Department
of Transportation

**United States
Coast Guard**

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U. S. Coast Guard

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COMDTNOTE 16000

MAY 31, 1996

COMMANDANT NOTICE 16000

CANCELLED: [illegible]

Subj: CH-4 TO COMDTINST M16000.11, MARINE SAFETY MANUAL, VOLUME VI, CHAPTER 8

1. PURPOSE. This Notice distributes the revised policy on Coast Guard fire fighting activities and requirements for marine fire fighting contingency planning as an integrated element of the Area contingency planning process.

2. ACTION. Area and district commanders and commanding officers of MSO/COTPs shall ensure appropriate distribution and implementation of this change. Revision of existing Marine Fire Fighting Contingency Plans (MFFCP) shall be in accordance with the new policy directives contained in the provisions of this instruction.

3. DISCUSSION.

   a. CH-4 to the Marine Safety Manual, Volume VI, Chapter 8 represents a major revision in the Coast Guard's policy and roles in the arena of Marine Fire Fighting.

   b. Central to the MSM change is the requirement for the development of Annex M of the Area Contingency Plans (ACP) as a replacement for the MFFCP or providing in the ACP a reference to a stand alone MFFCP developed in

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NON-STANDARD DISTRIBUTION: (See page 3.)

accordance with this MSM change. This will ensure rapid access to related response contingency and resources information. Annex M of all ACPs is to be reserved for Marine Fire Fighting.

4. PROCEDURES. Remove Chapter 8 from existing Marine Safety Manual, Volume VI and replace with CH-4.

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DIRECTOR OF FIELD ACTIVITIES
MARINE SAFETY AND ENVIRONMENTAL
PROTECTION

Encl: (1) CH-4 to COMDTINST M16000.11, VOLUME VI, CHAPTER 8

Non-Standard Distribution:

B:c CCGD9, 13 (15); CCGD8 (14); CCGD7 (11); CCGD5 (7); CCGD1, 17 (6); CCGD2, CCGD11 (5); CCGD14 (4); MLCLANT, MLCPAC (1).

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E:o New York (15); Grand Haven (4); Long Island Sound (3); Sault Ste. Marie (1).

F:jp Except Tampa.

ABS (8).
DOJ Torts Branch (Washington, DC; New York; San Francisco only) (1).
MARAD (MRG 4700) (1).
MSC (M-24) (1).
NOAA Fleet Inspection Officer (1).
NTSB (Marine Accident Division) (2).
World Maritime University (2).
U.S. Merchant Marine Academy, Kings Point, NY (1).

CHAPTER 8. COAST GUARD FIRE FIGHTING ACTIVITIES

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CHAPTER 8. COAST GUARD MARINE FIRE FIGHTING ACTIVITIES

A. Authority.

Among the provisions of the Ports and Waterways Safety Act of 1972 (PWSA) (33 U.S.C. 1221 et seq.) is an acknowledgment that increased supervision of port operations is necessary to prevent damage to structures in, on, or adjacent to the navigable waters of the U.S., and to reduce the possibility of vessel or cargo loss, or damage to life, property, and the marine environment. Section 4202 of the Oil Pollution Act of 1990 (OPA 90) (Public Law 101-380) mandates that the Coast Guard maintain an Area Contingency Plan of pollution response equipment (including fire fighting equipment) within each port. These statutes, along with the traditional functions and powers of the Coast Guard to render aid and save property (14 U.S.C. 88(b)), is the basis for Coast Guard fire fighting activities. 42 U.S.C. 1856-1856(d) provides that an agency charged with providing fire protection for any property of the United States may enter into reciprocal agreements with state and local fire fighting organizations to provide for mutual aid. This statute further provides that emergency assistance may be rendered in the absence of a reciprocal agreement, when it is determined by the head of that agency to be in the best interest of the United States.

B. Policy.

The Coast Guard has traditionally provided fire fighting equipment and training to protect its vessels and property. Commanding Officers of Coast Guard units (COTP's, Groups, Cutters, Stations) are routinely called upon to provide assistance at fires on board vessels and at waterfront facilities. Although the Coast Guard clearly has an interest in fires involving vessels or waterfront facilities, local authorities are principally responsible for maintaining the necessary fire fighting capabilities within U.S. ports and harbors. Additionally, a vessel/facility's owner and/or operator is ultimately responsible for the overall safety of vessels/facilities under their control, including ensuring adequate fire fighting protection.

The Coast Guard traditionally renders assistance as available, commensurate with each unit's level of training and the adequacy of equipment. The Commandant intends to maintain this traditional "assistance as available" posture without conveying the impression that the Coast Guard is prepared to relieve local fire departments of their responsibilities. Paramount in preparing for vessel or waterfront fires is the need to integrate Coast Guard planning and training efforts with those of other responsible agencies, particularly local fire departments and port authorities.

COTPs shall work closely with other Coast Guard units, municipal fire departments, vessel and facility owners and operators, mutual aid groups, and other interested organizations to ensure an integrated response plan is developed. The COTP shall incorporate fire fighting contingency planning in each port's Area Contingency Plan (ACP) for the COTP zone in accordance with this chapter.

C. Restrictions.

1. Operations. In developing a Coast Guard unit's assistance as available posture, consideration should be given to the fire threat level, the jurisdictions involved, the capabilities of local fire departments, the availability of Coast Guard equipment, and the level of Coast Guard training. The functions generally carried out by Coast Guard units in marine fire situations include:

   a. Participating in contingency planning for marine fire fighting;

   b. Conducting traditional Coast Guard response measures such as restricting access to the affected area and controlling marine traffic, conducting emergent SAR activities, notifying affected parties, and coordinating with local emergency services [NOTE: while marine fire fighting is sometimes incidental to SAR activities it is not specifically SAR.];

   c. Conducting a preliminary assessment of the incident to: 1) evaluate the magnitude of the threat to the public health and welfare and the environment, 2) determine if response actions by the responsible party are adequate, and 3) collecting information for the development of a response plan;

   d. Contacting the owner and/or operator to explain the Coast Guard's role and to gather information for response purposes;

   e. Based on the preliminary assessment, carrying out first aid mitigation actions commensurate with the level of personnel, equipment and training. First aid mitigation actions are those response actions taken by Coast Guard personnel necessary to address immediate concerns prior to the arrival of local fire services or actions by the responsible party;

   f. Monitoring response actions and providing assistance as available. Coast Guard personnel support may include supplying water and logistic

support to fire fighting forces, cooling exterior bulkheads/walls with hose lines or monitors, or enforcing a safety or security zone at the scene.

The program goal is that Commanding Officers of Coast Guard units shall be capable of performing those traditional response measures outlined above. Generally, Coast Guard personnel shall not directly engage in fire fighting activities on other than Coast Guard units except when necessary to save a life or when possible to avert a significant threat with minimal risk to Coast Guard personnel.

During marine fire fighting situations involving vessels or waterfront facilities, Commanding Officers of Coast Guard units shall adopt a conservative response posture, and shall focus their actions on those traditional Coast Guard activities listed above not requiring unit personnel to enter into a hazardous environment or be unduly tasked.

Any direct involvement by Coast Guard personnel in support of a regular fire fighting agency shall be under the supervision of the Incident Commander who shall be specifically briefed on the training and capabilities of the Coast Guard personnel.

Coast Guard personnel shall not engage in independent fire fighting operations, except to save a life or in the early stages of a fire to avert a significant threat without undue risk. [NOTE: An exception is fire fighting operations within the port area during certain defense readiness conditions.]

The above policies notwithstanding, there are occasions which necessitate certain calculated risks be taken to protect the public health and welfare. In such cases, risks to personnel will be reduced to the minimum level possible consistent with the operational situation and shall not be incurred for purely environmental purposes.

The Commandant recognizes the significance of the cautious approach which the Coast Guard has adopted for marine fire fighting situations. The high training, equipment, and staffing thresholds will limit the response capability of many units, and in some areas sources of support will not be readily available.

As a consequence, there will be occasions when a unit will be unable to mount a complete response to an incident. This circumstance is preferred to attempting a complex and potentially hazardous job without the necessary staffing, training and equipment.

2. Personal Protection And Training. Coast Guard personnel who support waterfront and vessel fire fighting operations shall be properly trained and equipped for the task they are assigned (see section G., pg. 8-30 for training guidelines). Coast Guard involvement shall be kept to a level commensurate with available training, equipment, experience, and leadership.

D. Contingency Planning For Fire Fighting Activities.

1. Introduction. The COTP is faced with a number of responsibilities and decisions when a shipboard or waterfront fire occurs. The decisions made may affect lives, millions of dollars in properties, and the free flow of maritime commerce. The Commandant has determined that contingency plans for fire scenarios, as they involve coordination with private, public and non-federal agencies, shall be developed by making an ACP reference to a stand alone Marine Fire Fighting Contingency Plan (MFFCP) or by developing the MFFCP as ANNEX M (reserved) to the ACP. A sample outline for contingency plan sections not covered in the ACP format is presented in Figure 8-1. Contingency plans must be updated in accordance with the ACP schedule and exercised with other interested organizations in order to detect possible problems or deficiencies.

2. Content. The marine fire fighting annex of the ACP shall describe the responsibilities of the lead organizations and the supporting actions of other agencies, including the Coast Guard, for various types and locations of fires. Specifically, the following statement concerning the relationship between local fire fighters and the master of a vessel must be included:

The presence of local fire fighters does not relieve the master of command of, or transfer the master's responsibility for overall safety on, the vessel. However, the master should not normally countermand any orders given by the local fire fighters in the performance of fire fighting activities on board the vessel, unless the action taken or planned clearly endangers the safety of the vessel or crew.

The marine fire fighting annex must also address how to respond to emergencies that develop during fire fighting operations (e.g., secondary explosions, injuries, trapped personnel, loss of water supply, or vessel drifting or sinking). As in the development of the spill response plan, the marine fire fighting annex must include an assessment of the resource and personnel requirements for each scenario. Shortfalls in meeting these requirements should be noted and alternatives identified.

3. Role Of The COTP. All Coast Guard fire fighting forces and equipment within a COTP's Area of Responsibility (AOR) shall be under the control of the COTP. The COTP is responsible for the development of the marine fire fighting annex with input from local response organizations, training of Coast Guard personnel, and coordination of Coast Guard personnel during incident response. The COTP shall act as the liaison between the Coast Guard and other response organizations and the media. Orders from the Incident Commander (as defined in paragraph 8.C.1) for Coast Guard responders shall be passed through and evaluated by the COTP. Only those orders that will not create unwarranted risk for Coast Guard personnel and equipment shall be executed. The COTP shall not assume overall control of fire fighting efforts when appropriate qualified fire officers are present and able to take control.

4. Marine Firefighting Coordinator (MFC). The MFC is the COTP's marine fire fighting technical expert and on-scene liaison with response organizations in marine fire fighting incidents. As the COTP's designated representative, the MFC is responsible for the development and coordination of the planning, training, and response objectives of Coast Guard fire fighting assets. In addition to the recommended training for Coast Guard personnel outlined in Section H of this chapter, the MFC should undergo advanced training in marine fire fighting strategy and tactics, and damage control, and should have completed the appropriate Marine Safety Training & Qualification (MST&Q) Booklet(s). The MFC should also be knowledgeable of the local fire fighting organization's capabilities and response management system.

5. Funding Of Fire Fighting Activities. In general, funding for Coast Guard fire fighting activities must come from Coast Guard Operating Expense (OE) funds. Under some circumstances, the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) Trust Fund, and the Oil Spill Liability Trust Fund (OSLTF) may be available to reimburse fire fighting expenses. This is limited only to those situations where the fire is fought specifically to abate the potential for, or fire resulting from, a pollution incident. Fire fighting activities related to the safety of life or property are generally not reimbursable from CERCLA funds or the OSLTF.

6. Basic Planning Considerations.

   a. Incident Notification. In the process of identifying and contacting parties that may be involved in a marine fire response, the following groups should be considered:

(1) Vessel owners and operators;

(2) Waterfront facility owners and operators:

(3) Local fire departments;

(4) Local police departments;

(5) Emergency service agencies;

(6) Port authorities;

(7) Mayor's or city manager's office;

(8) State fire marshal;

(9) Oil and hazardous substance cleanup companies;

(10) Private fire fighting services;

(11) Towing companies;

(12) Pilots' associations;

(13) Coast Guard Vessel Traffic Services (VTS);

(14) Marine exchange;

(15) Marine salvage companies;

(16) Longshoremen's unions;

(17) Marine chemists;

(18) Railroads;

(19) Utility service companies;

(20) Ship service companies;

(21) Shipyards;

(22) News media representatives;

(23) Aircraft reconnaissance sources;

(24) Self-contained breathing apparatus (SCBA) refilling sources;

(25) Fire fighting supply companies;

(26) Hospital supply companies.

(27) Coast Guard Marine Safety Center Salvage Team

(28) Navy Supervisor of Salvage

(29) Local mutual aid systems

b. Communications. Preestablished and effective communications procedures are essential to the execution of a safe and successful fire, rescue, or hazardous materials response. The larger the incident the more agencies that are likely to be involved in the response. Pre-planning of incident communications procedures will significantly reduce many of the difficulties which may arise during fire fighting operations. Consideration should be given to the following:

(1) Do the responders have the capability to communicate on common frequencies?

(2) Have standardized radio procedures and call signs been established?

(3) Has the effectiveness and limitations of communications been tested during exercises? The primary component of vessel construction is steel, which is an inhibitor of radio communication. A vessel's hard wired communication is not a recommended alternative if the vessel has sustained damage.

(4) Terminology used must be in common day to day language. Local fire fighters may not understand nautical nomenclature.

(5) The FCC has designated three frequencies, 154.126, 154.260, and 154.290 MHz, as the Fire Mutual Aid Radio Systems (FMARS) to provide for common communications between fire fighting units from different agencies operating at a common incident.

(6) Given the long duration that can be expected in a vessel fire incident and number of personnel who may be dependent upon portable radio communications, resources for additional radios, spare batteries and recharging units need to have been identified.

c. Actions Upon Notification. Prompt notification of all parties who have a need to know a fire has occurred is of utmost importance. The COTP should use a comprehensive notification list to ensure all parties have been notified. Upon notification of a waterfront fire, the COTP shall immediately determine the vessels in the fire area and the cargoes they are carrying. The COTP shall notify local shipping

agents of their vessels' involvement or possible involvement, and any anticipated need to move them. Coast Guard personnel should contact all vessels both in and outside the fire area and advise the deck watch officer of the situation and of the possible need to get underway.

d. Use Of Cleanup Contractors. The COTP may find that local pollution cleanup contractors are not adequately equipped to conduct activities where fires are involved. Development of this capability should be encouraged, as the spread of flammable liquids may result in the spread of a fire.

e. Involvement Of Pilots. Nearly all state pilotage laws require a pilot to be on board all large vessels moved within a port. The COTP should consider the pilotage laws when determining the need for pilots in emergency situations. Local pilots' associations should be contacted to determine their procedures for handling emergency movement of vessels and response times of their members to representative locations. If a fire is reported on board a vessel or at a grain elevator, oil terminal, or other high-risk facility, other vessels moored at that facility or near the involved vessel may have to be moved immediately, with or without tugs or pilots; this may be accomplished, if necessary, through a COTP Order.

f. Involvement Of Salvors And Marine Chemists. Salvors and marine chemists have a variety of unique skills which may be of use in a marine fire incident. A marine chemist tests the atmosphere of confined and poorly ventilated spaces for concentrations of oxygen and other gases which may be harmful, flammable, or explosive. During a marine fire, marine chemists can monitor conditions of an interior fire area and advise responders of chemical hazards that may be encountered. Commercial salvors operate a variety of specialized equipment to keep a vessel afloat or raise a sunken vessel. Because many salvors deploy their assets within a large area of operations, local salvors may not be able to respond as quickly as a more remotely based company. The U.S. Navy Supervisor of Salvage also maintains personnel and equipment which may be available.

g. Involvement Of Marine Safety Center Salvage Team. The U.S. Coast Guard Marine Safety Center Salvage Team is available 24 hours each day to provide COTP's with technical guidance during marine fire fighting incidents. Staffed with Coast Guard naval architects, the Salvage Team has the experience, training, and tools to help the COTP manage and minimize the risks associated with the stability

issues of the fire fighting effort. The Salvage Team can address critical issues that arise during an incident, such as stability of the damaged ship, fire fighting water discipline, lightering and ballasting sequences, and tug requirements. The Salvage Team can also evaluate residual strength, estimate the amount of oil spilled or consumed by the fire, and predict the effects of tides on a stranded vessel. The responsible party and commercial salvor will address these issues as they develop their salvage plan; when it is prepared, the Salvage Team can provide the COTP a crucial independent assessment.

h. Use of Vessel Traffic Services. Where available, Vessel Traffic services can be an indispensable aid to the COTP in the notification of mariners, requesting assistance, and routing port traffic within the COTP's Area of Responsibility (AOR). The incorporation of available VTS resources into marine fire fighting planning and exercises is highly recommended.

7. Response Management System.

a. Implementation. In initiating their response, local fire fighters will likely adopt the Incident Command System (ICS), which is the response management system utilized by most fire departments. A response management system puts into motion set procedures for the activation, utilization, and control of personnel, facilities, equipment, and communications from the initial notification through final resolution of an incident. The response management system concept provides different agencies and organizations a method to accomplish a common goal in a productive, efficient and effective manner through a preestablished but dynamic modular organizational structure. In order to establish a cohesive response, Annex M should detail the integration of the local fire department's response management system with the Coast Guard's Unified Command System.

b. Incident Size-up. Size-up is a continual process at the heart of any response action. Any course of action must be based upon the available facts and probabilities. The size-up consists of six steps to rapidly form a deliberate plan of action: gathering facts, assessing probabilities, determining resources, applying basic fire fighting principles, deciding a course of action, and formulating a plan of operations. Quickly gathering incident information, such as the exact location of the vessel, location of the vessel's master and crew, acquiring the vessel's documents (especially the pre-fire plan), condition of the vessel (including status

of the fuel and ballast tanks and any other flooding and stability issues), type and condition of cargoes on board, and identification of any special equipment needs. Incident probabilities, potential life hazards, explosions, damage, and fire extension must also be assessed. The dynamic nature of any fire response requires constant review, reevaluation, and revision.

c. The Command Post. The first fire officer to arrive on the scene will assume command of the incident and establish a command post. The COTP should encourage local fire officials to predetermine a staging area for every marine terminal in the zone as a part of pre-fire planning. Following the size-up, action planning will result from the Incident Commander's objectives. The command post will keep track of what's been ordered, what's in progress and what has been completed. Unless the complexity of the incident necessitates a communications section, the Command Post will assume this responsibility and coordinate between groups who do not have compatible frequencies. Ideally, each responding agency should have a representative at the command post to aid in coordination of their respective agency with the overall response effort.

d. General Response Management System Organization. There are four organizational divisions which are fundamental to the majority of Response Management Systems: operations, planning, logistics, and finance. The operations section will supervise the actual control of the fire. This includes responsibility for the determination of the location and state of the fire, evaluating exposures, evaluating access and egress routes, laying supply hose lines to the vessel, and accounting for the vessel's crew and passengers. The planning section will collect, evaluate, and disseminate information about the incident, as well as resources used or needed at the scene.

The logistics section will maintain the staging area, develop an equipment pool, facilitate equipment re-supply, and coordinate with relief agencies as necessary to operate rest and refreshment services for response personnel. The finance section is responsible for managing and tracking all incident costs, and evaluating the financial aspects of the incident. Success in the utilization of a response management system is measured in the clear delineation of roles and responsibilities within the chain of command in and between each section. Paramount above all else, however, is the need for active, concise communications between and within each section.

8. Planning A Marine Fire Fighting Exercise. Contingency plan exercises are the best method to evaluate the effectiveness of the fire fighting annex and conduct essential training for the familiarization and coordination of potentially involved agencies. The following outlines the suggested basic steps for planning a marine fire fighting exercise:

   (1) Identify and coordinate the availability of a suitable vessel and facility for the exercise platform. Points of contact should be the vessel owner, vessel agent and port authority.

   (2) Contact training representatives of agencies who would be involved in a marine fire (a list of agencies and their point of contact with the authority to commit personnel and equipment should be included in the marine fire fighting contingency plan).

   (3) Set up an initial planning meeting. Items for discussion at the meeting should include Coast Guard fire fighting policy, training objectives of the exercise, emphasis the use of the Incident Command System and develop an organizational outline of persons who will fill the various roles of ICS.

   (4) Develop a plausible drill scenario with a suggested time line. Prepare an organizational chart reflecting response management roles and their objectives.

   (5) Hold a second planning meeting to resolve planning, logistics, and operations questions. Set up a one day workshop covering role responsibility and objectives, safety, vessel types and construction, vessel pre-fire planning, shipboard extinguishing agents and systems, and vessel fire fighting strategy and tactics. The local fire department should be encouraged to pre-plan the exercise site.

   (6) Conduct post exercise critiques of the contingency plan, organization and management, and unmet resource needs. Evaluation of specific strategy and tactics and should be addressed internally by each agency.

9. Port Entry And Movement Of A Burning Vessel.

   a. Essential Considerations. The decision to allow a burning vessel to enter or be moved within the port can be a difficult one for the COTP. Various scenarios should be planned to consider the possible outcomes of that decision. The COTP should approach

such a situation with the view that the overall safety and security of the port is the key factor. The possibility of a vessel sinking in a channel or spreading fire to other vessels or facilities must be evaluated. The port should not be jeopardized to save a single vessel if the risk is too great. Risk evaluation (and cost-benefit analyses where applicable) should be employed during the planning process. The primary considerations for allowing a burning vessel to enter into, or be moved within, the port are:

(1) Location and extent of fire;

(2) Class and amount of cargo involved;

(3) Possibility of explosion;

(4) Possibility of sinking/capsizing;

(5) Hazards to crew or other resources at present location;

(6) Weather forecast;

(7) Maneuverability of vessel (Is it a dead ship?);

(8) Effects on bridges that must be transited

(9) Hazards to the environment; and

(10) Alternatives if the vessel is not allowed entry or movement.

b. Allowing Entry Or Movement Of The Vessel. Before entry or movement is permitted, the vessel should be examined (with other involved agencies, if possible) to determine its condition. Permission for entry or movement may generally be granted when:

(1) The fire is already contained or under control;

(2) There is little likelihood that the fire will spread;

(3) A greater possibility exists that the fire may be extinguished with equipment available in-port before secondary explosion or spread of fire; and

(4) All appropriate parties, including elected officials, have been consulted.

[NOTE: A request for entry into the port by a burning vessel under declaration of "force majeure"

should be evaluated under the same previously listed criteria.]

c. Additional Considerations Prior To Entry Or Movement. Once the decision to permit entry or movement of the vessel has been made, consideration should be given to:

(1) A safety broadcast and Notice to Mariners;

(2) Ordering the movement of other vessels or cargo stored in the area to preclude their involvement; and

(3) Locating the vessel to facilitate the use of available resources in fire fighting.

d. Liability Factors In Consideration Of Vessel Entry.

(1) The amounts and types of insurance held;

(2) Verification of coverage for liability for any oil pollution removal costs, as evidenced by a valid Certificate of Financial Responsibility (COFR);

(3) Liability insurance for possible damages caused to other property;

(4) A surety bond, in an amount equal to the estimated cost of removing the vessel from the port.

[NOTE: While these assurances are highly desirable, obtaining them may not be possible before action is required to save the vessel.]

e. Considerations For Denying Entry Or Movement.

(1) A danger, greater than the immediate danger to the vessel, crew, or cargo, that the fire will spread to other port facilities or vessels;

(2) A likelihood of the vessel sinking or capsizing within a navigable channel;

(3) A likelihood that the vessel may be abandoned as a derelict;

(4) Unfavorable weather or environmental conditions that preclude the safe movement of the vessel or fire fighting efforts; and

(5) A risk of a serious pollution incident of oil or hazardous substances. The COTP should, in conjunction with district (m) staff and the

Regional Response Team (RRT), assess pollution risks and determine whether a vessel should be allowed to enter port.

E. Fire Fighting On Vessels.

1. Importance Of Vessel Location. The success or failure of shipboard fire fighting efforts is a condition of the vessel's location; if the vessel is remotely located or otherwise inaccessible, there may be little opportunity to save it. The COTP should coordinate with fire departments, port officials, and other involved agencies to pre-select moorage, anchoring, or grounding sites for burning vessels.

a. Considerations For Moorage Locations.

(1) The flammability of pier structures and contiguous facilities;

(2) Availability of adequate water supply;

(3) Access for response boats and vehicles;

(4) Minimizing the risk of impeding navigation;

(5) Location of low risk to facilities or vessels, consistent with minimizing the distance the vessel must be moved.

b. Considerations For Anchoring Or Grounding Locations.

(1) Bottom material and formation should not pose an undue risk of rupturing the vessel's hull

(2) Water depth should be shallow enough that the vessel will not sink below the main deck level, yet deep enough that fireboats, salvage barges, and tugs can approach; and

(3) Environmental conditions: strong winds or currents may hamper fire fighting, salvage, or other response efforts. Tidal influences and river level fluctuations must also be considered.

c. Intentional Sinking Of Vessels. As a last resort when a vessel and its cargo are deemed to be a constructive total loss due to a fire, an alternative to further fire fighting and salvage efforts may be to sink the vessel. Transportation and disposal of vessels must be accomplished in accordance with COMDTINST 16451.5 series, which provides guidance concerning the Intervention on the High Seas Act (IHSA), and 40 CFR 229.3, which outlines authorities

and general procedures. Except in extreme emergencies when vessel disposal is contemplated as a viable option, the vessel's flag state, EPA's Regional Response Team (RRT) representative, and other parties known to have interests which may be affected should be consulted.

2. Operational Fire Fighting Priorities.

   a. Rescue. Life safety must always be the first consideration in any fire or emergency situation. When lives are in danger, the incident commander must quickly assess whether the situation necessitates immediate removal of personnel, the number of persons which need to be extracted, and the hazards to the rescue team.

   b. Exposures. The fire should be fought so as to prevent the spread of fire on or off the vessel. Typical exposures include flammable liquid or gas tanks, open stairways, explosives, or any other substance which would accelerate or aid the spread of the fire. Provided there is no danger of water reactivity, exposures are best cooled by application of a fog pattern until no visible steam is generated. For some two-dimensional surfaces foam may be an appropriate agent for exposure protect.

   c. Confinement. The effort to establish control over the fire through impeding the fire's extension to non-involved areas and limiting the fire to its area of origin. To accomplish proper containment, all closures and generally all ventilation (unless personnel are trapped inside the space) should be secured. Establish primary fire, smoke, and flooding boundaries. Primary boundaries are critical to the control of a fire. Monitor and cool the boundaries, as necessary (if steam is produced when sprayed with a fog pattern, continue to cool the surface), on all six sides of the fire (fore, aft, port, starboard, above, and below).

   d. Extinguishment. Attack and suppression of the main body of the fire. The goal is to cease combustion by disrupting the cycle of the fire tetrahedron. Tactics and agents to be used will be determined by the fuel source, amount of fuel/surface area, and the location of the fire.

   e. Overhaul. Actions to complete incident stabilization and begin the shift to property conservation. Considerations during overhaul include: hazards from structural conditions at the fire scene, Atmospheric conditions (air packs should remain mandatory in the case of interior fire overhaul due to the likely

presence of toxic vapors, carbon monoxide, and low oxygen levels), monitor scene to ensure the fire will not re-ignite, determination of the fire's point of origin and source of ignition. Detailed photographic records of the fire scene prior to clearing any debris is highly recommended to aid in post fire investigations.

f. Ventilation. Ventilation tactics will vary depending upon the location and conditions of the fire. The choice to secure or utilize ventilation will alter the tactics used to combat the fire. Generally, all ventilation on a vessel will initially be secured and all dampeners shut upon receipt of a fire alarm. The purpose in ventilation shutdown is both to decrease the flow of oxygen to the fire area and to begin the containment process. However, this tactic may cause a fire to extend through cableways, false overheads, plumbing, etc. Utilization of ventilation to aid fire fighting efforts should not begin until a coordinated attack is staged. For example, ventilation can be used to aid fire fighters in gaining access to and prevent the travel of smoke and other fire gases from the involved space(s) by turning exhaust fans on high and supply fans on low, meanwhile ventilation in spaces surrounding the fire should be positively pressurized with supply fans on high and exhaust fans secured. However, improper use of this method could also result in backdraft conditions.

3. Vessel Stability Considerations.

a. Introduction. The stability of a vessel is described as its ability to resist heeling from the upright position at small angles of inclination. The large volumes of water often used combating fires can have a negative impact on vessel stability, jeopardizing the safety of the vessel and the personnel on board.

b. Consulting Personnel. The COTP or his designee may be expected to provide advice regarding vessel stability issues and should command a basic knowledge of the topic. A list of technical experts should also be compiled as apart of the marine fire fighting contingency plan. This list should include the Coast Guard Marine Safety Center Salvage Team which is always available to provide technical guidance on stability issues. At a minimum, Coast Guard personnel who are likely to respond in incidents where stability of a vessel is at issue should be familiar with NFPA 1405 and *Stability And Trim For The Ship's Officer*, by John La Dage and Lee Van Germert, published by Cornell Maritime Press.

c. Fire Fighting Factors Affecting Vessel Stability. The introduction of large amounts of water onto the vessel can create a free surface effect which is particularly dangerous if the water is confined above the vessel's normal center of gravity. Personnel and equipment moving through watertight doors cause potential problems by disrupting flooding boundaries.

d. Stability Affects On Fire Fighting. The most important consideration regarding vessel stability is the control of a vessel's list. Problems resulting from a failure to maintain a reasonable degree of transverse stability can include:

(1) Poor footing for response personnel,

(2) Difficulty in maintaining a foam blanket,

(3) Automatic fire door closure problems,

(4) Damage/injury from shifting of loose objects,

(5) Reduced effectiveness of fixed dewatering suctions and drains,

(6) Loss of use of vessel machinery due to sustained excessive list.

e. Vessel Factors Affecting Stability.

(1) The free surface of all liquids on board,

(2) The integrity of the hull,

(3) Whether the double bottoms are empty or full,

(4) Integrity of watertight boundaries during flooding, and

(5) Flatness of the hull bottom if the vessel is in contact with the bottom.

f. Vessel Documentation. Several vessel documents can be useful in determining vessel stability. The most important of these is the vessel's trim and stability booklet. Other useful documents are the cargo plan, the docking plan, the capacity plan, and the general arrangement plan. If this information is for some reason not available on board the vessel, it should be available from the vessel's owner or operator. Ideally, Coast Guard and/or local fire fighters would maintain copies of the pre-fire plan for those vessels which regularly call at their port. Note that per 33 CFR 155.240, owners and operators of oil tankers and offshore oil barges shall ensure by no

later than January 21, 1995, that their vessels have prearranged, prompt access to computerized, shore-based damage stability and residual strength calculation programs. Access to the shore-based calculation program must be available 24 hours a day. Per 33 CFR 155.245, owners or operators of inland oil barges shall ensure by no later than January 21, 1995, that the vessel plans necessary to perform salvage, stability, and residual hull strength assessments are maintained at a shore-based location. Access to the plans must be available 24 hours a day.

g. Water Discipline. Water is the most prevalent fire extinguishing agent. Water suppresses fire through absorbing heat when converted into steam and the resulting smothering effect as steam displaces the air around the fire. In general, 0.03 m^3 (1 ft^3) of water will generate 48 m^3 (1700 ft^3) of steam; enough to smother 6 m^3(200 ft^3) of fire under ideal conditions (closer to 3 m^3 (100 ft^3) in practice). The indiscriminate use of water, however, particularly in vessel fires, can be as dangerous as the fire. In considering the use of water versus other extinguishing agents the questions of potential electrical hazards, the presence of any water reactive materials, and the problems of flooding and the resulting stability issues must be answered before proceeding.

At best, indisciplined water usage may precipitate excessive water damage and disrupt the thermal balance of an interior fire resulting in reduced visibility, and severe heat conditions from the production of large amounts of steam. The thermal balance is the discernible separation between the heated fire gases in the upper portion of a compartment and the relatively cooler air below. The heated gases may exceed 704 °C (1300 °F). Disruption of the thermal balance can be avoided for as long as possible by proper application of direct and indirect attack techniques. In the worst case, disregard for the amount of water put on board will deteriorate the vessel's stability. Four liters (1 gal) of sea water weighs 3.9 kg (8.6 lbs); at a flow rate of 6 liters/second (L/s) or 100 GPM, a 1 m^2 (12 ft^2) space will be flooded 0.152 mm (6 in) in roughly 5 minutes, adding approximately 2 metric tons (2 tons). A 64 mm (2½ in) hose, which is commonly found on vessel weather decks, delivering 2 L/s (250 GPM), equates to approximately 54 metric tons (60 tons) per hour; while the 38 mm (1½ in) hose normally found at interior fire stations will deliver approximately 27 metric tons (30 tons) per hour.

h. Dewatering. A vessel will sustain a loss of

stability from fire fighting water accumulation above the vessel's original water line. For this reason, dewatering is an essential planning issue for successful vessel fire fighting. Normally, vessels will have a limited amount of dewatering equipment. This equipment will often consist of a fixed pump and suction system to handle water which accumulates in the vessel's bilges and drain holes located in areas above the waterline to allow drainage overboard or into the vessel's bilge. Portable pumps are sometimes available on board, but their limited capability will not substantially aid dewatering efforts. Removal of toilets and showers to improve drainage will allow water to flow down into holding tanks below the waterline. While the weight of the water is still a factor, the shift in weight to the holding tanks will lower the vessel's center of gravity and improve transverse stability. In extreme cases, drainage holes may be cut in the superstructure. This practice, however, can be extremely dangerous and should not be pursued without the permission of the owner or other appropriate authority. In planning for the eventuality of a dewatering effort, Annex M must give consideration to the quality of discharged water and the need for containment.

i. List Correction. The basic causes of list are a negative metacentric height (GM), or "angle of loll", which is caused by having the center of gravity too high in the vessel, and/or an off center position of the vessel's center of gravity (CG). When in doubt as to the cause of the list, always attempt to lower the vessel's center of gravity. The following outlines a general sequence of actions to limit deterioration and potentially improve vessel stability:

(1) Establish flooding boundaries,

(2) Remove water from partially flooded areas,

(3) Jettison topside weight,

(4) Completely remove water from solidly flooded areas,

(5) Transfer weight (usually liquid ballast). If the list is caused by a location of the center of gravity off the vessel's centerline, shifting weight to the high side will remove the list, however, if negative GM is a factor of the list, transverse shifting of weight within the vessel will worsen the situation. In a case in which the center of gravity is located above the

metacentric height, the center of gravity must be lowered to correct the list.

(6) Add weight (counterflooding). Always start with the lowest spaces available, such as double bottom tanks. Never counterflood if free surface is the cause of the list. Problems resulting from added weight and free surface effect make counterflooding a last resort.

4. Fixed Fire Fighting Systems.

a. Fire Main Systems. The fire main system is the primary tool for defending the vessel from fire. There are two basic designs of fire main systems, the single main and the looped main. The looped main has certain advantages due to the ability to isolate sections of the system without disrupting service to the stations beyond that ruptured section. Water pressure is provided by on board fire pumps. The number of pumps will depend upon the vessel's tonnage; generally a vessel will have two pumps, a primary pump dedicated to supplying the fire main and a reserve pump which may also supply the sanitary, ballast, bilge, or general service system.

Any pump which supplies a fire main must be capable of supplying 345 kilopascals (kPa) (50 psi) (517 kPa (75 psi) for tank vessels) streams simultaneously to the two stations with the highest pressure drops. The pumps require electrical power, but are tied into the vessel's emergency as well as primary ship service generators. The fire stations, or hydrants, supplied by the fire main will be of a sufficient number and so located that any part of the vessel can be reached with two streams of water from separate stations with at least one stream through a single length of hose. In machinery spaces, any area must be reached by two streams through a single length of hose supplied from separate hydrants. Local response agencies should be aware that hose station connections on foreign vessel will likely have a different thread and that generally adapters will not be available. Therefore, if the decision is made to utilize the International Shore Connection (see E.5, p.8-24), and the vessel's fire main, fire fighters will be forced to rely on equipment which may be unfamiliar possibly poorly maintained.

b. Water Sprinkler Systems. Due to construction in accordance with Method I of the Safety Of Life At Sea (SOLAS) convention, which provides for fire protection though noncombustible construction materials, sprinkler systems are not widely used on U.S. merchant vessels in other than accommodation

spaces and Roll-On/Roll-Off vehicle decks. The primary roles of the sprinkler system are structural protection and to maintain escape routes. Sprinklers are of two varieties, automatic (wet pipe) and manual (non-detection, deluge). Automatic systems are maintained under pressure and are activated by a fusible link in the sprinkler head while the more common manual systems have an open valve assembly and are supplied directly by the ship's fire main. An important note is that both systems require power for the associated pumps to supply operating pressure, although the automatic system relies upon a pressure tank for its initial dump of about 757 liters at 103 kPa (200 gallons at 15 psi). The required power source should be available from the vessel's emergency generator if the ship's service generator is unavailable. Hazards associated with water sprinkler systems are the possibility of flooding, and its effect on stability.

c. Carbon Dioxide Systems. Carbon dioxide is a versatile extinguishing agent as it does not damage cargo, does not conduct electricity, and provides its own pressure for discharge. However, CO_2 is only effective if all ventilation and openings to the space are secured.

As a smothering agent, CO_2 lacks any considerable cooling properties, therefore the carbon dioxide concentration in the space must be maintained until heat levels in the fire area drop below the ignition temperature of fuel source. Additionally, CO2 poses a significant life threat due to its ability to displace oxygen, causing asphyxiation, even in low concentrations. CO_2 systems are primarily installed in machinery spaces and cargo holds. Discharge is accomplished manually; either remotely by two pull handles outside the affected compartment or by directing the discharge point from the CO_2 bottle (high pressure system)/storage tank (low pressure system) room. Due to the life threat and often variable discharge points, it is recommended that the vessel's plans be reviewed and/or preferably a member of the vessel's crew, knowledgeable about the system, be consulted prior to its operation.

d. Halon 1301 Systems. Halon (bromotrifluoromethane) is a colorless and odorless gas, approved by the U.S. Coast Guard for use in machinery space fixed systems on merchant vessels. Halon 1301 has extinguishing properties similar to carbon dioxide: it is a nonconductor, very effective against class B and C fires (Halon 1301 can be used to extinguish class A fires provided the fire is not deep seated), leaves no residue, is stored as a liquid in cylinders, and

does not require an external power source for discharge. Fixed Halon 1301 systems require manual activation through two pull boxes located outside the protected space or from the bottle storage space. An evacuation alarm will precede the discharge. Inhalation of Halon will cause dizziness and impair coordination. Also, under exposure to open flame at around 500°C (900°F), Halon 1301 will decompose into a gas that is toxic. The toxicity from decomposition is prevented by the high rate of delivery which acts to rapidly extinguish the flames.

e. Foam Systems. Foam is primarily used to combat flammable liquid (class B) fires. Although foam does posses some cooling properties, it is a smothering agent. Foam is traditionally available in two varieties, chemical and mechanical. Shipboard installation of chemical foam systems is, however, no longer approved by the Coast Guard. Mechanical foam is produced by mixing a foam concentrate with water and then rapidly aerating the resultant solution. The ratio of water to foam concentrate determines the expansion ratio and, therefore, the physical properties of the foam.

Foam with a low expansion ratio will be wetter, heavier, more heat resistant (provides a longer lasting blanket), and less affected by wind. These properties, however, also make low expansion foam less adherent to vertical surfaces and more electrically conductive. A lower expansion ratio will also provide better flow around obstructions, making this mixture well suited for service in class B machinery space and tank vessel deck fires. Fixed deck foam systems must be install on tankers constructed after 1 JAN 1970.

f. Steam Smothering Systems. The steam is supplied by the ship's main or auxiliary boilers for use in cargo tanks/holds, pump rooms and bilge fire suppression. This system may be present on some older vessels, however, steam smothering cannot be installed on any US flag vessel contracted after 1 JAN 62 and is generally no longer an accepted method of shipboard fire suppression. Other than the heat hazard for personnel, the use of steam as a smothering agent can easily hinder fire fighting efforts rather than help. By its nature steam has very little cooling effect and is often a high enough temperature to ignite some liquid fuels. Also as steam cools, it condenses, reducing the smothering effect. It is also important to note that application of steam smothering to fires involved with nitrates, sulfates, and explosives will have disastrous effects.

5. International Shore Connection.

   a. Introduction. The International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, requires an "international shore connection" to be carried on board all passenger and cargo vessels over 500 gross tons subject to SOLAS, and U.S. inspected vessels of 1000 gross tons or more. This universal coupling, as illustrated and described in 46 CFR 162.034, is designed to connect fire main systems between one vessel and another or between a shore facility and a vessel. The connection shall be constructed of material suitable for 1034 kPa (150 psi) service; it shall have a flat-face flange on one side, and a permanently attached coupling that will fit the vessel's fire main piping and hoses on the other side. The flange can be fitted with a gasket and bolted quickly, enabling an assisting vessel or facility to provide fire main pressure to a distressed vessel.

   b. Coast Guard Enforcement. The Coast Guard is responsible for U.S. implementation of these requirements. COTP's shall ensure that international shore connections are carried on board vessels in U.S. ports as required. COTP's should encourage facility operators, municipal fire departments, and other interested response organizations to obtain these couplings and have them readily accessible.

6. General Tactics For Common Vessel Spaces.

   a. Introduction. A shipboard fire will present the unprepared fire fighter with an endless variety of difficulties. To ensure the readiness of the port, the COTP must have full confidence in not only the Coast Guard members in the command, but also in the knowledge and abilities of the local response services responsible for that port. One of the easiest and most beneficial steps in accomplishing this is to encourage the local fire department to periodically accompany Coast Guard marine inspectors on vessel inspections. In this way fire fighters can become acquainted with the construction, layout, organization, and available fire fighting apparatus on board a variety of merchant vessels. These visits will allow fire fighters to conduct a pre-planning fire survey. If a single survey can be conducted for each vessel which makes regular port calls, the survey can then be distributed as necessary to other fire fighters.

   b. Public And Accommodation Spaces. By the nature of their use, the first concern in responding to a fire in accommodation spaces is the rescue of victims.

The National Fire Protection Association (NFPA) describes a fire in these spaces as being very similar to shore side structural fires. While this description is accurate, it can also be misleading. The vessel's steel construction, below deck locations, and a high content of synthetic materials will raise heat levels dramatically compared to a shore side structural fire. Fire fighting efforts will likely be additionally complicated by access and egress problems and difficulty in effective utilization of ventilation techniques. Extinguishment and overhaul of accommodation space fires can also be problematic due to the threat of fire extension through cableways, false overheads and other void spaces.

c. Engine Room And Machinery Spaces. The engine room refers to the space in which the vessel's propulsion engine is located and machinery spaces refer to the location of the auxiliary systems necessary for the vessel to function. This machinery includes systems such as hydraulics, sewage, fuel and lube oil, compressed air, and steam systems, as well as the machinery which provide electricity, and hotel services. A fire in these spaces is easily the most difficult to control and extinguish. Access to an engine room/machinery space fire can be complicated by a maze of catwalks, decks, and gratings that may be slick with petroleum products and will hinder hose line advancement. The variety and size of machinery spaces can make rescue operations difficult. While the vessel's fire plan should be consulted, the vessel's engineering department can provide invaluable information on the access, layout, and obstructions that are present in these spaces. Before attempting to attack an engine room fire, verify that all personnel have been evacuated from the space, that the emergency equipment shutdowns have been utilized, and that ventilation, power, and watertight doors to the space have been shutdown. With these steps completed, utilize the space's fixed system. If the resources are available, multiple dumps of extinguishing agent may be required before the fire can be controlled. Reentry to the space following use of a fixed system must not take place until the space has had time to cool. The amount of time necessary for cooling to effectively take place will vary with the size and intensity of the fire. Prior to reentry, automatic watertight doors should be set to manual to prevent possible personnel injury and severing of a hose line. The point of reentry should be the lowest possible access point to allow fire fighters improved visibility and reduced heat conditions. Should entry from above the fire level prove necessary, ventilation should remain secured

until the fire is extinguished to prevent pulling the fire up to the fire fighters as they enter the space.

F. Special Considerations According to Vessel Type.

1. Freight Vessels.

a. Introduction. Freight vessel cargo holds come in four basic types: dry bulk, break bulk, roll-on/roll-off (Ro/Ro), and container. Each of these present particular hazards to the fire fighter. In general, as with any fire situation, it is very important to know what is burning. This is doubly true of cargo vessels due to the possible variety of goods on board with different characteristics and reactive properties.

To determine what cargo is on board and where it is located, the vessel's Cargo Manifest and especially the Dangerous Cargo Manifest, should be reviewed. If possible, the review should be done in consultation with the vessel's master. Until the decision is made as to the best method of extinguishment, identification of a cargo off-loading site, and overhaul and disposal procedures are set, the hold should be sealed and the fixed fire suppression system should be activated. If the fixed system is activated, bulkheads temperatures should be monitored hourly to track progress. Because any attempt to enter the hold after fixed system activation will introduce air into the fire area and allow escape of the extinguishing agent, the most important factor in utilizing a fixed system in this situation is the having the patience to allow the agent time to take effect.

b. Dry Bulk. Dry bulk holds generally contain goods such as grain, coal, ore, scrap metal, or other particulate matter loaded directly into a hold without packaging; much like liquid in a tanker. The danger associated with a hold full of grain is similar to that of a silo: spontaneous combustion, dust explosions, and product expansion with the addition of water. A hold containing coal may require cargo discharge to extinguish the fire. Coal that is heating spontaneously should be leveled, trimmed, and packed down tightly in the hold to minimize the chance of fire. Scrap metal cargos will probably require that the hold be sealed and inerted while cooling exposures.

c. Break Bulk. Break bulk is loaded into a vessel's hold as packaged goods in crates, bags, or barrels, etc. The cargo may be supported and separated by dunnage (wood palettes, etc.), which will present

additional class A fire hazards. Cargo on break bulk vessels is most commonly loaded vertically into the holds by cranes through a series of large hatches. As subsequent holds are loaded, it is common for cargo to be placed on the hatch to the lower hold. Access to the lower holds can difficult in these situations, often leaving scuttles and steep ladders as the only method of entry. For this reason, use of the installed fixed system is often the best course of action until a coordinated attack can be made. To aid in preventing the spread of the fire, cargo in holds with adjacent bulkheads should be moved away from the affected hold and the bulkheads should be cooled as necessary.

d. Container. Containers provide uniform modular handling of packaged and liquid goods. Containers may be stacked on deck or stored in holds. Due to the often large number of containers and the manner of stowage, access to a specific container can be difficult. In order to complete extinguishment and overhaul of the fire, it is best if the container can be removed from the vessel once the fire can be controlled. Both the affected container and those surrounding it need to be externally cooled. If the container is on deck, control of the fire inside a container is often best achieved by determining the required agent for the contents and applying the agent through a small hole high on the side closest to the hottest point. The recommended procedure if the container is in a hold is basically the same, unless the container cannot be reached, in which case the hold should be buttoned up and the fixed system dumped.

e. Roll-on/Roll-off (Ro/Ro). Ro/Ro vessels are generally comprised of several parking garage like decks designed to maximize the storage of motor vehicles. The hull on some Ro/Ro vessels have a very high freeboard; this height can be sufficient to cause complications in the staging of operations and equipment on the vessel. Access to the cargo decks can often best be established through side ports and cargo loading ramps. Close storage of cargo will likely cause difficulty in accessing a particular area or unit of cargo. If possible, it is generally best to employ the fixed system (usually a sprinkler or CO_2 system) in the cargo deck until the fire area can be accessed for a direct attack.

f. Commercial Fishing Vessels. Fishing vessels comprise a specialized sub-type of freight vessel which includes trawlers, fish tenders, and fish processing vessels. The arrangement of the holds and stowage of catch/cargo often bare similarities to a small break

bulk or dry bulk vessel. The hazards associated with these vessels are also similar to other freight vessels often with an addition of a large refrigeration system used to preserve the cargo. The use of a refrigeration system can hold potential hazards to responders due to the use of anhydrous ammonia (NH_3) as the primary refrigerant. Exposure to anhydrous ammonia in its liquid state will cause serve burns on contact, and in a gaseous state possesses properties which cause severe irritation to eyes, skin, and mucous membrane as well as possibly causing fatal respiratory damage.

Other than exposure hazards for fire fighters, a release of anhydrous ammonia in an enclosed space introduces the possibility of a combustion explosion. Although characterized as having a limited flammability and low heat of combustion, in a fire scenario, enough pressure can be developed to cause major structural damage.

2. Bulk Liquid Tank Vessels.

a. Introduction. Today's tank vessels are capable of transporting large quantities of liquid products. Tank vessels can be divided into three categories: petroleum carriers, liquefied gas carriers, and chemical carriers. It is not uncommon for a tank vessel to carry a variety of liquids in its segregated tanks. Deck fires on tankers are one of the most common vessel fire scenarios. These fires usually result from over filling tanks or the spillage of product onto the deck from a leak or rupture of the piping system. The practice of plugging scuppers during cargo operations will often help to contain a spill to the deck of the vessel. The presence of on deck cargo piping systems will hinder the advancement of fire fighting operations. The key to control and extinguishment in deck fire situations is to reduce/remove the fuel source by shutting down the cargo system. System shutdown is best accomplished when performed by personnel knowledgeable about the system's operation. Fire fighters should take care to preserve the integrity of the tanks and cargo piping system.

b. Petroleum. For petroleum on deck, the best course of action is to employ foam, provided sufficient quantities are available to maintain an unbroken blanket over the entire surface of the exposed product. If feasible, the placement of fire resistant containment booms around the vessel would be prudent. It is also important to note that under 33 CFR 155.1050 and 33 CFR 155.1052, vessel response plans, required for vessels which carry group I-V

petroleum oils, must identify and ensure the availability of both a salvage company with expertise and equipment, and a company with vessel fire fighting capabilities in the area(s) which the vessel operates. The availability of these pre-planned resources should not be overlooked during a marine fire fighting scenario.

c. Liquid Natural Gas (LNG)/Liquid Propane Gas (LPG). Natural gas and Propane gas are the two most common liquefied flammable gases. For transport, these gases are liquefied through a cryogenic process.

This process results in a significant volume reduction (by a factor of 600 for natural gas and a factor of 270 for propane gas). The vessels which transport these gases generally utilize large insulated spherical tanks for product storage. The tanks are isolated within the vessel's hull by cofferdams designed to contain low volume leakage from the tanks. Despite differences in physical characteristics, when ignited, the effective methods of extinguishment are similar. Vessel's which carry LNG/LPG are fitted with deck water spray systems. The spray system is intended primarily for the protection of exposures (vessel superstructure, storage tanks, and cargo system) from the extreme radiant heat produced by natural and propane gas fires. The spray system will also aid in confinement of the fire area, protection of metal surfaces from embrittlement fractures caused by contact with cryogenic liquids, and the dissipation of unignited vapor. In addition to the spray system, most gas carriers will be fitted with a dry chemical system with sufficient agent to protect the weather deck. In the event that hose lines are brought to bear on the fire, high velocity fog may be employed to disperse unignited vapor, but the high velocity fog pattern should never be used directly on the liquid as it will only serve vaporize the liquid. In ports which handle LNG and LPG tankers, the COTP is required to maintain LNG/LPG Vessel Management and Emergency Contingency plans, these plans should be consulted for area specific guidance in handling these vessels.

d. Chemical. The bulk transport of liquid chemicals has become one of the major commodities shipped by water. Because many chemicals possess characteristics which could endanger responders, proper identification of the hazards present is the key to responding to any chemical or hazardous material incident. Although the Coast Guard sets guidelines for the bulk shipment of chemicals, the potential dangers of chemicals mixing on a multi-product tanker cannot be

overstated. A response strategy cannot be formulated before issues of toxicity, volatility, and reactivity (especially to water and other fire fighting agents) are resolved. Clearly, the integrity of the tanks and cargo system must be maintained. In some instances, it may be prudent to employ the available fixed systems rather than risk the safety of responders in a direct attack upon the fire. The Incident Commander must also evaluate the necessity to evacuate the scene and surrounding area due to the existence or potential threat of plume development.

3. Passenger Vessels.

a. Introduction. Fire fighting operations on passenger vessels can be extremely difficult. Public and accommodation spaces on passenger vessels will often present a higher fire load than other vessels because of the quantity of synthetic materials used to enhance the vessel's appearance. Another result of these cosmetic enhancements will be the existence of many void spaces and probably a complex ventilation system which will contribute to the spread of fire and smoke. Large passenger vessels, such as cruise ships, are constructed with a large number of small compartments connected by narrow passageways and ladders. The layout of many of these vessels all but ensures that the Incident Commander, even with the benefit of pre-fire planning, will be faced with manpower shortages as fire fighters become fatigued and air supplies are exhausted in efforts to locate and extract victims, and then access and extinguish the fire.

b. Special Planning. The COTP's shall work with the passenger vessel industry, the port authority, and local response and relief agencies operating in their respective zones or AOR's to ensure the coordination of these parties for the evacuation of and accountability for the vessel's passengers in the event of fire or other emergency. An accurate account of persons both ashore and aboard the vessel is critical in expediting the pace and aiding to ensure successful fire fighting and rescue operations. The sooner search and rescue is completed the sooner efforts can be focused upon property conservation. The displacement of up to several hundred passengers will require pre-planning for lodging, medical attention, meals, transportation, and communications. While these factors are principally the concern of the industry, the COTP has a vested interest in ensuring these factors have been addressed within the port.

G. Training.

1. Introduction. Proper training is essential for Coast Guard personnel and municipal fire department personnel who respond to waterfront and vessel fires. Ideally, Coast Guard personnel who support or interact with municipal fire departments should be as well trained as the most minimally trained personnel with whom they will interact (including local fire fighters and crew members of merchant vessels).

   Although the training programs envisioned here will not make Coast Guard men and women professional fire fighters, but it will help them understand their capabilities and limitations, as well as those of municipal fire departments. Training for Coast Guard personnel that support municipal fire departments in the event of waterfront or vessel fires is a multi-phased process. Training in accordance with Fire Fighter Level I specified in NFPA Standard 1001, Standard for Fire Fighter Professional Qualifications, will provide comprehensive basic fire fighting training. This standard is available from the National Fire Protection Association, 1 Batterymarch Park, Quincy, Massachusetts 02269. Coast Guard personnel shall have knowledge of the municipal fire department organization and capabilities. Frequent exercises between the Coast Guard, municipal fire departments and other concerned agencies should be conducted to help involve each party to understand roles, responsibilities, capabilities and limitations of all concerned.

2. NFPA Standard Training. A nationally recognized and certified training program that meets or exceeds NFPA 1001 standards for entry level professional fire fighters should be used. Many fire departments can provide this training locally. This avenue of training should be explored carefully, considering the costs and the benefits of being trained by the organization that will likely request Coast Guard support. This level of training provides:

   a. Basic fire science;

   b. Fire inspection requirements;

   c. Safety, first aid, and rescue techniques; and

   d. Concepts and hands-on experience in the use of breathing apparatus, ropes, fire appliances, sprinkler systems, water streams, ventilation techniques, and communications during fire fighting operations.

3. Follow-Up Training. Follow up training broadens the basic knowledge obtained through NFPA Standard 1001 and applies it to situations on board vessels. The Coast Guard generally sends field personnel to the Advanced Marine Fire Fighting Course offered by Texas A&M University, College Station, TX, for unit personnel who may be designated as Marine Fire Fighting Coordinators.

   This course consists of classroom and fireground exercises designed to familiarize mariners with the chemistry and physics of fire, shipboard fire fighting agents and equipment, fixed extinguishing and detection systems, breathing apparatus, considerations for hazardous cargoes, fire prevention, shipboard search and rescue, and first aid. The fireground exercises provide an opportunity to use common shipboard equipment in fighting various types of fires. [NOTE: The Damage Control and Fire Fighting courses offered by the U.S. Navy do not address structural fire fighting problems; they are not acceptable alternatives to NFPA Standard 1001 or follow-up training.]

4. AOR Coast Guard Personnel Resource List. A list of Coast Guard personnel (regular/reserve/auxiliary) with fire fighting training and their qualifications should be developed for inclusion in Annex F, Appendix III, Tab A of the ACP.

5. NFPA 1405, A Guide for Land-Based Fire Fighters Who Respond to Marine Vessel Fires.

   a. Introduction. The National Fire Protection Association developed NFPA 1405 at the request of, and in cooperation with, the United States Coast Guard and with the assistance of the fire service and maritime communities. The Coast Guard provided representatives to the Subcommittee for Land-Based Fire Fighters Who Fight Marine Vessel Fires.

   b. Purpose. NFPA 1405 was developed for use by local fire fighting organizations that may be confronted with a fire aboard a vessel. This publication identifies the elements required to formulate a comprehensive marine fire fighting response program. NFPA 1405 discusses vessel familiarization, training, response techniques, contingency planning, and the hazards a fire fighter may face in combatting a vessel fire. The guide also recommends practices to use in responding to fire in the maritime environment. NFPA 1405 provides an excellent resource of information which will aid fire fighters to safely and efficiently extinguish a marine vessel fire.

c. Defining The Coast Guard Role. Many citizens and the local fire departments believe that the Coast Guard is responsible for complete fire fighting activities in the event of a vessel fire. NFPA 1405 can be used as an informational tool to educate civilian fire fighters of the role the Coast Guard fire fighting policy.

Chapter 12 of the Guide for Land-Based Fire Fighters Who Respond to Marine Vessel Fires, discusses the Coast Guard's role in responding to a vessel fire. This chapter provides a brief summary of the Coast Guard's responsibility and capabilities in the event of a vessel fire. Also discussed in this chapter is the development of contingency plans and their importance to ensuring a timely, efficient response to a fire in the port environment.

d. NFPA Publications. Copies of NFPA publications are available from the National Fire Protection Association, 1 Batterymarch Park, Quincy, Massachusetts 02269.

e. NFPA 1405 Familiarization. All Coast Guard personnel who have completed fire fighting training should also have a working knowledge of NFPA 1405. This standard identifies several elements necessary for an efficient response to a vessel fire in the port environment.

H. Headquarters Support. The Oil Pollution Act of 1990, Section 4202, requires the Coast Guard to include fire fighting equipment in its contingency plans. However, the Commandant does not intend to greatly expand the Coast Guard's fire fighting equipment beyond the OPA 90 requirements. The procurement of protective clothing and specialized equipment in quantities sufficient to protect Coast Guard personnel involved in fire fighting at or on Coast Guard units will continue. This policy may require stockpiling of fire fighting chemicals and equipment in some locations. The Offices of Engineering Logistics and Development (G-E), Law Enforcement and Defense Operations (G-O), Navigation Safety and Waterways Services (G-N), and Marine Safety, Security and Environmental Protection (G-M) will coordinate retrofitting and procurement of necessary fire fighting equipment and protective clothing. The Offices of Health and Safety (G-K) and COMDT (G-E) will ensure that the latest design, equipment and procedural information is available to operational program directors for the safest most effective use of Coast Guard resources.

FIGURE 8-1

OUTLINE FOR ANNEX M OF THE AREA CONTINGENCY PLAN

ANNEX M -- MARINE FIRE FIGHTING

Appendix I: Policy And Responsibility

1. Federal Policy
2. State Policy
3. Local Policy
4. COTP Responsibility
5. Nonfederal Responsibility

Appendix II: Response Organization

1. Local Fire Response Organization
2. Predesignation of Responsibilities for Various Scenarios

Appendix III: Marine Fire Fighting Scenarios

Scenarios should be developed following the general guidelines for ANNEX I: Scenario Development in COMDTNOTE 16471 dtd 30 SEP 92 and should be based on the types of facilities and vessels common within the OSC's/COTP's AOR. It is not expected that all OSC's/COTP's will encounter all of the possible scenarios listed below.

1. Waterfront Facility (Break Bulk and/or Bulk Liquid)
2. Tank Vessel (Cargo Tank and/or Engine Room)
3. Freight Vessel (Break Bulk and/or Container)
4. Bulk Solid Cargoes (Cargo and/or Engine Room)
5. Passenger Vessel (Cruise Ship and/or Gaming Vessel)
6. Tank Barge
7. Liquefied Gas Carrier (LNG/LPG)

Appendix IV: Marine Fire Fighting Resources

The intent of this section is to list those resources not already included in the ACP that would be needed in a marine fire situation. Examples include local stockpiles of fire fighting foam, sources of supply for additional foam, specialized sources of marine fire fighting assistance, marine chemists, etc ...

OSC's/COTP's may also consider including a condensed listing of those resources currently listed in other sections of the ACP that are of primary interest in a marine fire situation.

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